

[Intra-cluster response model and parameter for channel modeling at 60GHz (Part 3)]

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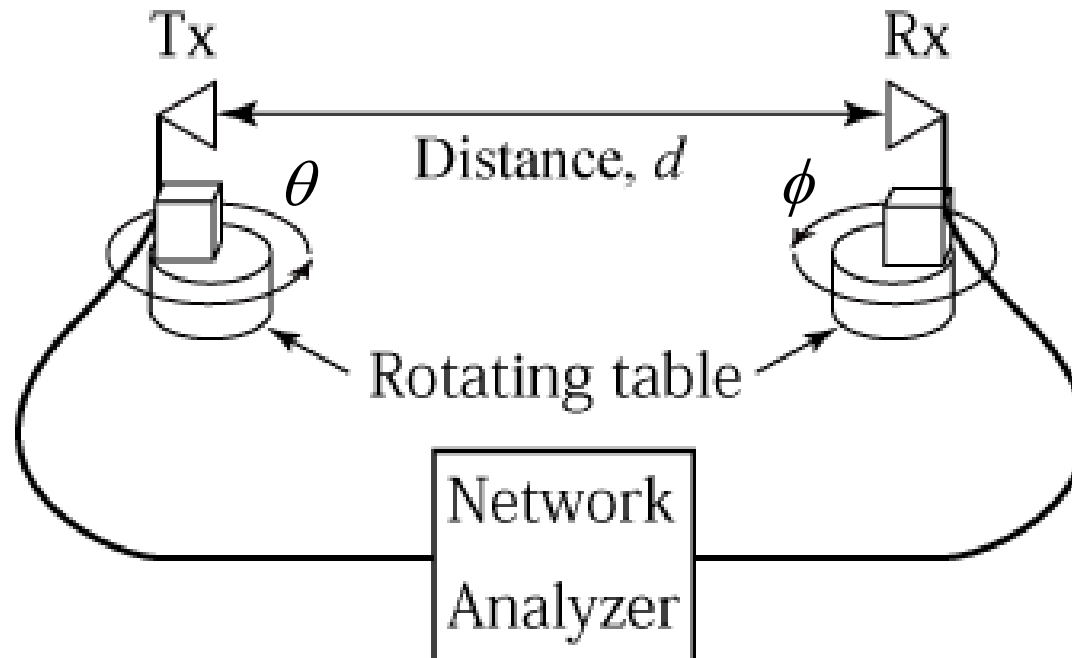
Abstract

- This paper will give all intra-cluster parameters for 3 different environments defined by TGad
- To align intra-cluster channel models, this paper has adopted K-factor and ready to be integrated with inter-cluster channel models given by doc. 09/334r4 by Alexander

For simpler PHY simulations:

- Single channel model for each living, conference, and cubicle room environment is good preferable rather than too many channel models
- We suggest to use the channel model with 30 degree HPBW antennas and vertical polarization for simulation scenarios for directional antenna communications.

Measurement system



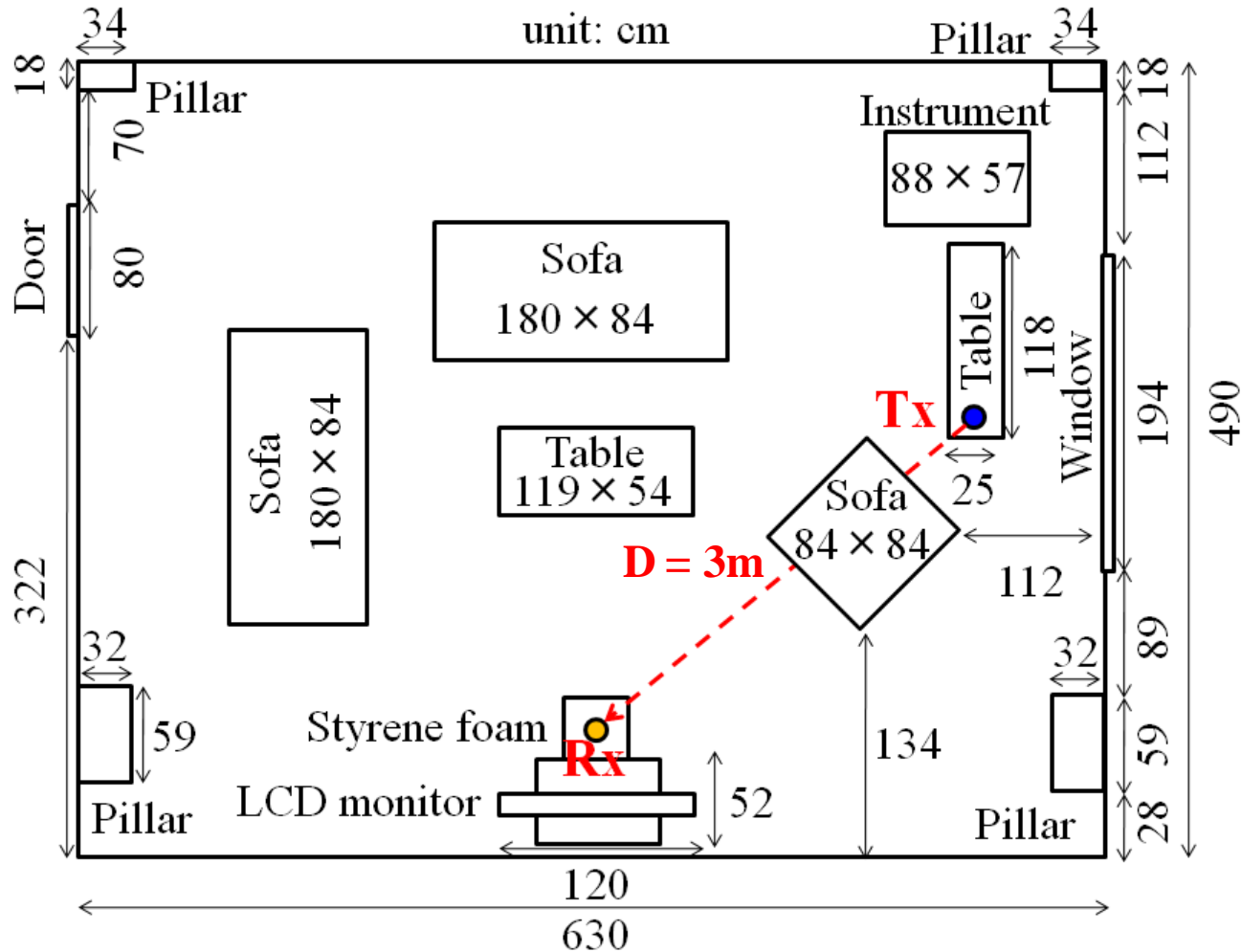
- Instrument: Vector network analyzer
- Antenna: Conical horn antenna

Measurement set up

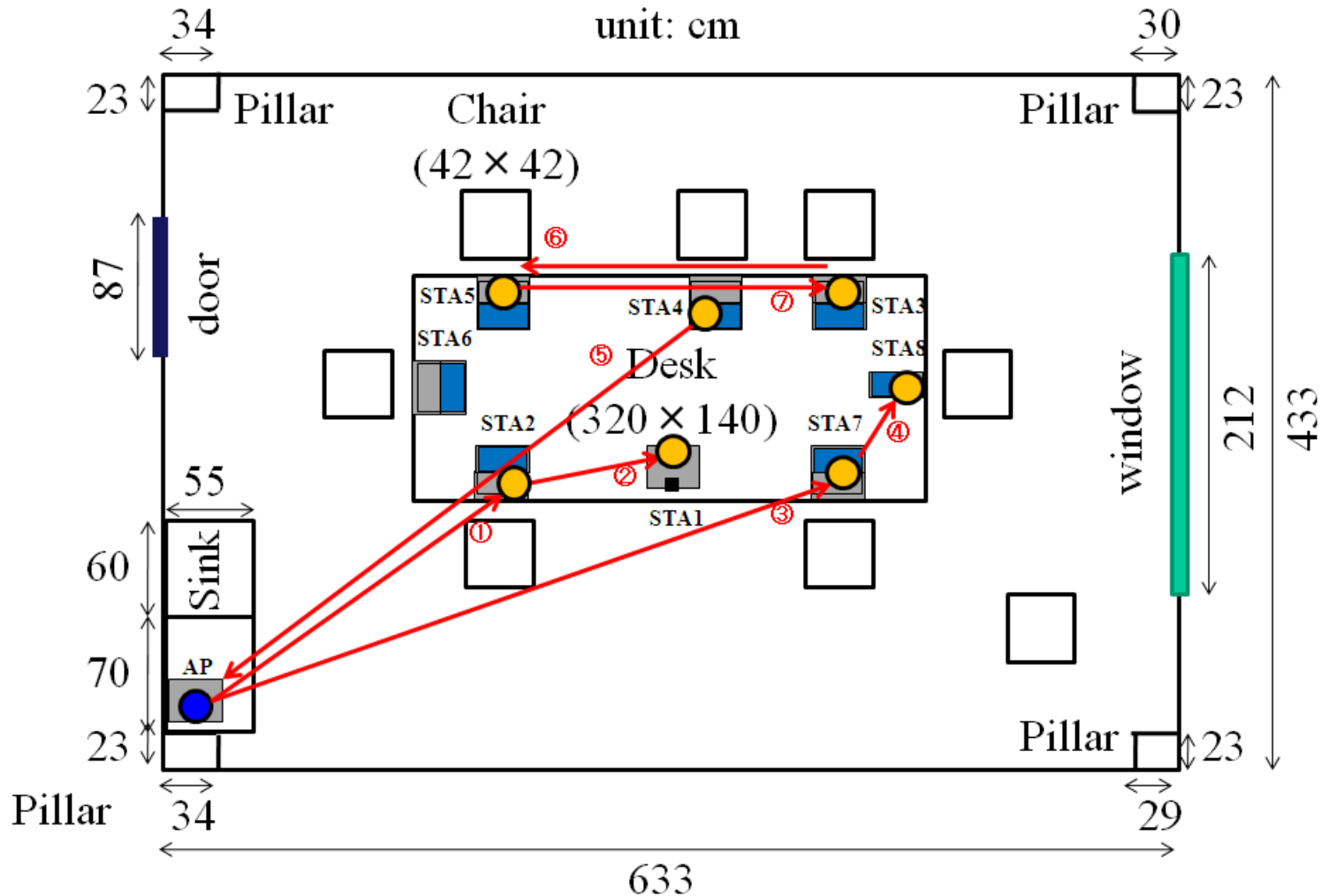
Parameter	Value
Center frequency	62.5 GHz
Band width	3 GHz
Number of frequency points	801
Frequency step	3.75 MHz
HPBW of antenna (Gain)	30degree(STA), 90 degree(AP)
Polarization	Vertical(STA), Circular(AP)
Calibration	Direct port connection without antennas

Living room environment 'defined by TGad'

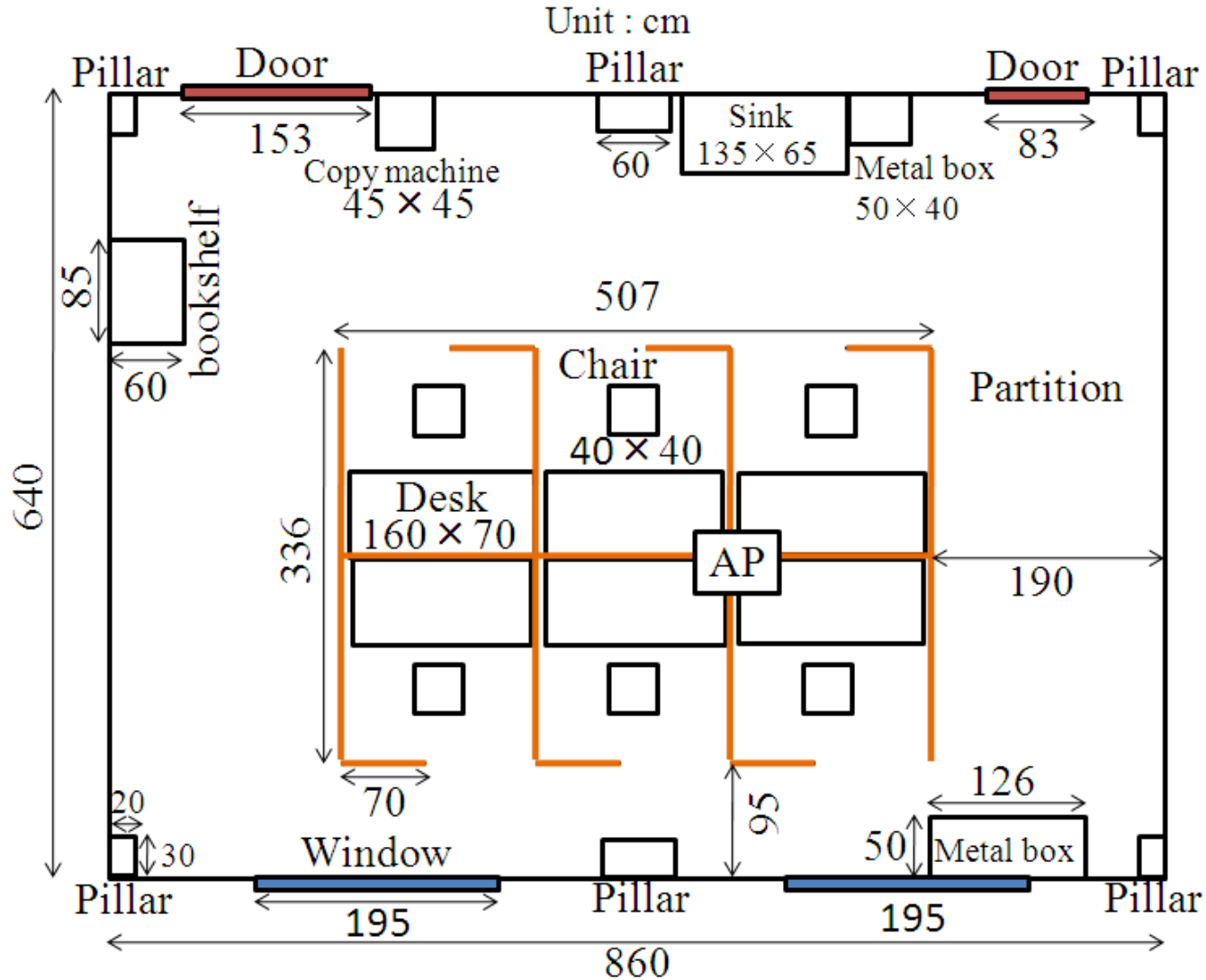
Antenna height:
1.5m (LoS scenario)
1.0 m (NLoS scenario)



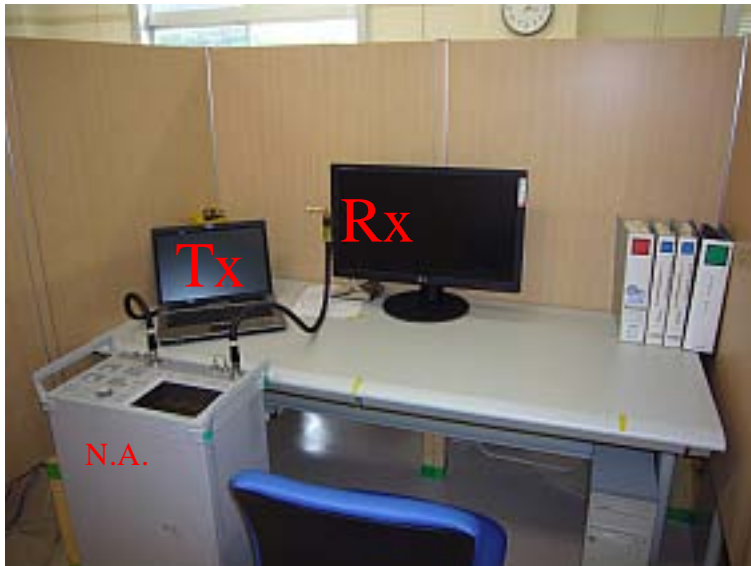
Conference room environment “defined by TGad”



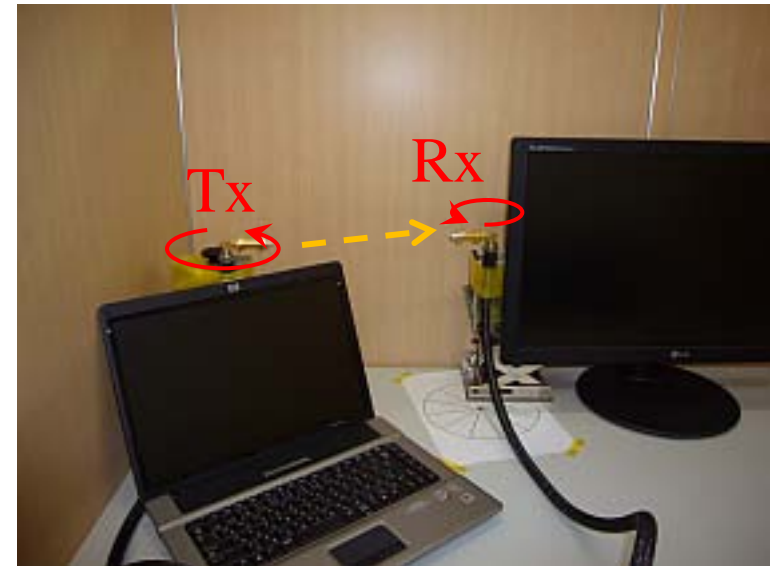
Floor plan of cubicle office



STA-STA link



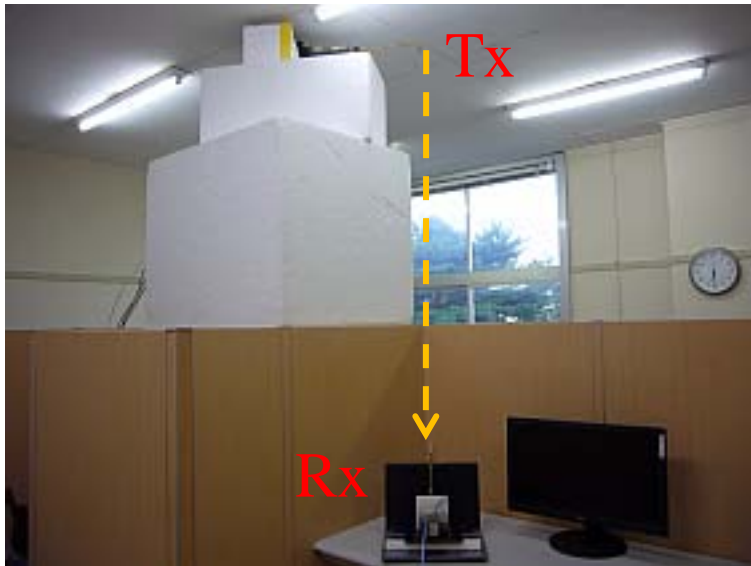
Measurement set up



Manually rotation (30deg step)

This is a very short transmission scenario.

AP-STA link



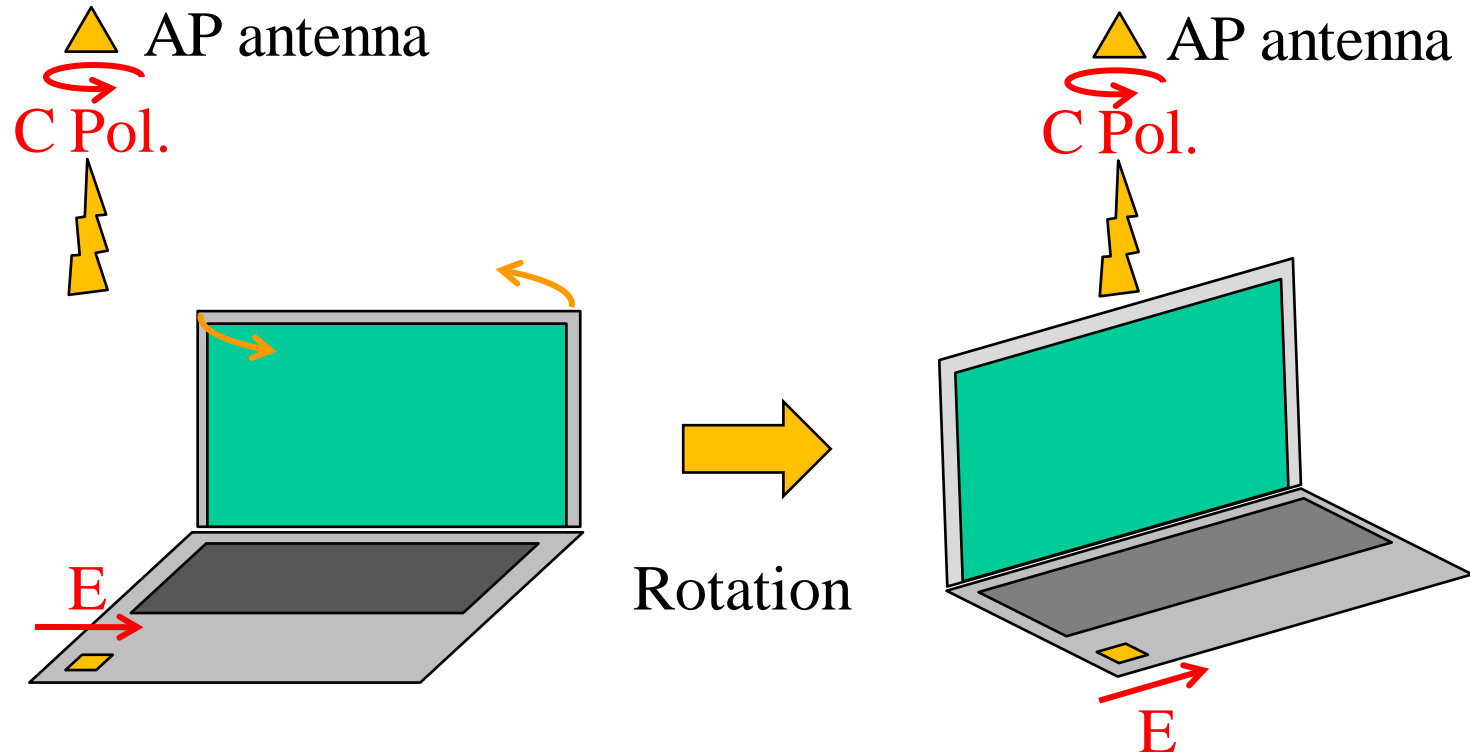
AP-STA Link



Inside of a cubicle

This is a vertical transmission link scenario.

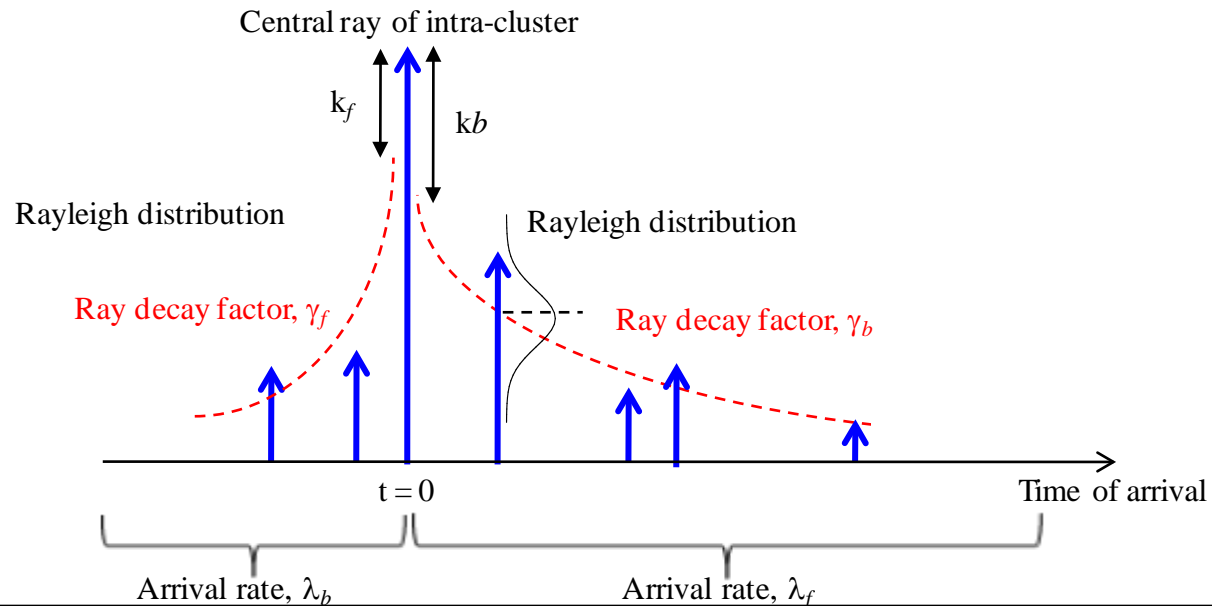
Circular polarization is adopted for AP antenna



- Polarization mismatch is generated by rotation of PC
- Circular polarized signal wave has adopted for AP antenna

Intra-cluster parameters for all environments (Ant. HPBW: 30deg, V pol.)

Environments		k_f [dB]	k_b [dB]	γ_f [ns]	γ_b [ns]	λ_f [ns ⁻¹]	λ_b [ns ⁻¹]	Distribution	Distribution
Living room		11.5	10.9	1.25	8.7	0.277	0.996	Rayleigh	Rayleigh
Conference room		16.8	18.4	6.13	6.29	0.547	0.501	Rayleigh	Rayleigh
Cubicle	STA-STA LOS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	AP-STA	N/A	24.5	N/A	0.690	N/A	1.13	N/A	Rayleigh



Summary of Intra-cluster Parameters for Conference Room Environment

Proposal; Averaged intra-cluster parameters are used for conference room channel model –two measured environments (Doc.09/433r4 and Doc.10/112r1)

Parameter	Notation	Value Doc.09/433r4	Averaged Value
Pre-cursor rays K -factor	K_f	5 dB	10 dB
Pre-cursor rays power decay time	γ_f	1.3 ns	3.7 ns
Pre-cursor arrival rate	λ_f	0.20 ns ⁻¹	0.37 ns⁻¹
Pre-cursor rays amplitude distribution		Rayleigh	Rayleigh
Number of pre-cursor rays	N_f	2	6
Post-cursor rays K -factor	K_b	10 dB	14.2 dB
Post-cursor rays power decay time	γ_b	2.8 ns	4.5 ns
Post-cursor arrival rate	λ_b	0.12 ns ⁻¹	0.31 ns⁻¹
Post-cursor rays amplitude distribution		Rayleigh	Rayleigh
Number of post-cursor rays	N_b	4	8

Summary of Intra-cluster Parameters for Living Room Environment

Proposal; Intra-cluster parameters extracted from measured data (Doc.10/112r1)

Parameter	Notation	Value
Pre-cursor rays K -factor	K_f	11.5 dB
Pre-cursor rays power decay time	γ_f	1.25 ns
Pre-cursor arrival rate	λ_f	0.28 ns ⁻¹
Pre-cursor rays amplitude distribution		Rayleigh
Number of pre-cursor rays	N_f	6
Post-cursor rays K -factor	K_b	10.9 dB
Post-cursor rays power decay time	γ_b	8.7 ns
Post-cursor arrival rate	λ_b	1.0 ns ⁻¹
Post-cursor rays amplitude distribution		Rayleigh
Number of post-cursor rays	N_b	8

Conclusion

- **Intra-cluster channel models for two environments are integrated and proposed (Doc.09/433r4 and Doc.10/112r1): 30 degree HPBW antennas for both Tx/Rx and vertical polarization**
- **Ready to merge with inter-cluster channel models**
- **Preliminary intra-cluster parameters for cubicle environment are presented**